

REMARKS

Claims 1-18 are now pending in the application. Claims 19-29 are withdrawn from consideration and, therefore, have been cancelled. In this Amendment, claims 1, 4-7, 9, 11, 13, and 15-18 have been amended. Each amendment to the claims is fully supported by the specification and drawings as originally filed. No new matter has been added. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Claims 15-18 stand rejected under 35 U.S.C. § 112, second paragraph. This rejection is respectfully traversed. The Examiner alleges that it is not clear whether in each through-hole, one or many metal layer(s) is(are) formed. Applicant respectfully asserts, however, that claim 15 does not call for a through-hole. As such, Applicant respectfully asserts that claim 15 is not indefinite and, furthermore, requests that the Examiner reconsider and withdraw the rejection under 35 U.S.C. § 112, second paragraph.

REJECTION UNDER 35 U.S.C. § 102

Claims 1-3, 5 and 7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Watanabe, et al. This rejection is respectfully traversed.

Claim 1, as amended, calls for a method for forming a bump comprising the steps of forming a resist layer so that a through-hole formed therein is located over a pad and forming a metal post on the pad conforming to the shape of the through-hole.

Claim 1 also calls for the metal post to be formed so as to have a shape in which is formed a recess for receiving a soldering or brazing material.

In contrast, Watanabe discloses a step of forming a resist layer having a through-hole formed therein, but the through-hole is not located over a pad. Furthermore, Watanabe fails to disclose a step of forming a metal post having a shape in which is formed a recess for receiving a soldering or brazing material. As such, Watanabe fails to disclose the claimed subject matter and, as such, fails to anticipate the claimed invention.

Claims 2, 3, 5 and 7 further define the methodology of claim 1. Inasmuch as Watanabe fails to teach or suggest the method of claim 1, dependent claims 2, 3, 5, and 7 are also in condition for allowance.

REJECTION UNDER 35 U.S.C. § 103

Claims 9, 11, and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Watanabe. These rejections are respectfully traversed. Applicant respectfully submits that claims 9, 11 and 13 are allowable for at least the same reasons as set forth above with respect to their base claims.

Claim 4 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Watanabe in view of Chen. This rejection is respectfully traversed. Applicant respectfully submits that claim 4 is allowable for at least the same reasons as set forth above with respect to its base claim.

Claims 15-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Farnworth, et al. These rejections are respectfully traversed. Claim

15 calls for a method of fabricating a semiconductor device comprising the steps of bonding a plurality of metal posts to a plurality of leads through a soldering or brazing material, each of the metal posts formed on each of a plurality of pads of a semiconductor chip, and each of the metal posts having a shape in which is formed a recess for receiving the soldering or brazing material. Furthermore, claim 15 calls for the soldering or brazing material, when melted, to be allowed to flow into the recess of each of the metal posts for receiving the soldering or brazing material so as not to spread onto an adjacent pad of the plurality of pads.

In contrast, Farnsworth teaches a continuous metal layer 34 formed over spaced apart projections 26 so as to define recesses therebetween. Farnsworth fails, however, to teach a metal post which is formed on a pad and has a shape in which is formed a recess for receiving a soldering or brazing material. As such, Farnsworth fails to teach or suggest the claimed invention and, therefore, fails to render the claims unpatentable.

Therefore, reconsideration and withdrawal of this rejection are respectfully requested.

ALLOWABLE SUBJECT MATTER

Claims 6, 8, 10, 12, and 14 stand objected to as being dependent upon a rejected base claim but were deemed allowable in rewritten in independent form. Claim 6 is amended herein to recite the subject matter of original claim 1. Claims 8, 10, 12, and 14 depend from claim 6. A continuing indication of the allowability of this subject matter is respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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ATTACHMENT FOR CLAIM AMENDMENTS

The following is a marked up version of each amended claim in which underlines indicate insertions and brackets indicate deletions.

1. (Amended) A method for forming a bump comprising the steps of:
forming a resist layer so that a through-hole formed therein is located [on]
over a pad; and
forming a metal [layer] post on [to be electrically connected to] the pad
conforming to the shape of the through-hole,
wherein the metal [layer] post is formed so as to have a shape in which is
formed a [region] recess for receiving a soldering or brazing material.

4. (Amended) The method for forming a bump according to claim 1,
wherein a plurality of the through-holes are formed in the resist layer so
that at least a part of each of the through-holes is superposed on the pad, and
a plurality of the metal [layers] posts are formed, each of the plurality of
the metal [layers] posts conforming to each of the through-holes to form the [region]
recess for receiving the soldering or brazing material between the adjacent metal
[layers] posts of the plurality of the metal [layers] posts on the pad.

5. (Amended) The method for forming a bump according to claim 1,
wherein the metal [layer] post comprises first and second metal [layers]
posts,

wherein the first metal [layer] post is formed in a state in which the resist layer is formed, and the second metal [layer] post is formed on the first metal [layer] post.

6. (Amended) [The method for forming a bump according to claim 1,] A method for forming a bump comprising the steps of:

forming a resist layer so that a through-hole formed therein is located on a pad; and

forming a metal layer to be electrically connected to the pad conforming to the shape of the through-hole;

wherein the metal layer is formed so as to have a shape in which is formed a region for receiving a soldering or brazing material;

wherein the metal layer comprises first and second metal layers,
wherein the first metal layer is formed in a state in which the resist layer is formed, and

after removing the resist layer, the second metal layer is formed so as to cover a surface of the first metal layer.

7. (Amended) The method for forming a bump according to claim 5,
wherein the pad is covered with an insulating film,
the resist layer is formed on the insulating film,
an opening for exposing at least part of the pad is formed in the insulating film
after forming the through-hole in the resist layer, and

the first metal [layer] post is formed on the pad in a state in which the resist layer is formed.

9. (Amended) The method for forming a bump according to claim 5, wherein the first and second metal [layers] posts are formed by electroless plating.

11. (Amended) The method for forming a bump according to claim 5, wherein the first metal [layer] post is formed of a material containing nickel.

13. (Amended) The method for forming a bump according to claim 5, wherein the second metal [layer] post is formed of a material containing gold.

15. (Amended) A method of fabricating a semiconductor device comprising the steps of:

bonding a plurality of metal [layers] posts to a plurality of leads through a soldering or brazing material, each of the metal [layers] posts formed on each of a plurality of pads of a semiconductor chip, each of the metal [layers] posts having a shape in which is formed a [region] recess for receiving the soldering or brazing material,

wherein the soldering or brazing material, when melted, is allowed to flow into the [region] recess of each of the metal [layers] posts for receiving the soldering or brazing material so as not to spread onto an adjacent pad of the plurality of pads.

16. (Amended) The method of fabricating a semiconductor device according to claim 15,

wherein [at least one depression] the recess is formed in a side of one of the metal [layers] posts, and

the soldering or brazing material is allowed to flow into the [depression] recess.

17. (Amended) The method of fabricating a semiconductor device according to claim 15,

wherein one of the metal [layers] posts is formed so that [a depression which] the recess is [provided] formed in the direction of the height of the metal [layers] posts [is formed at the center], and

the soldering or brazing material is allowed to flow into the [depression] recess.

18. (Amended) The method of fabricating a semiconductor device according to claim 15,

wherein two or more metal [layers] posts of the plurality of metal [layers] posts are formed so as to be connected to one of the pads, and

the soldering or brazing material is allowed to flow into a region formed between the adjacent metal [layers] posts of the plurality of metal [layers] posts on one of the pads.